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SUMMARY

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DEVELOPMENTS IN THE PRODUCTION, CASTING AND FABRICATION OF IRON AND STEEL IN RELATION TO SMALL TONNAGE STEEL PLANTS

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SUMMARY

1. The developments in the production of steel, under circumstances where market demand is not sufficient to maintain a modern blast furnace integrated with a steel mill, are discussed briefly.

2. One of the obstacles to the development of an integrated steel industry in under-developed countries is the general shortage of capital, which is of considerable consequence since a steel industry requires large investments.

3. Installation of an integrated steel plant based on classical production processes, including the reduction of iron ores by coke in blast furnaces, can only be justified on economic grounds if the market demand of steel products is above a certain minimum.

4. In addition to the excessive initial investment involved, a blast furnace unit lacks the flexibility of operation that must be reckoned as one of the requirements in less-developed areas where the market is small. It appears that consideration should therefore be given to the many direct reduction methods of making iron other than conventional blast furnace since, in general, they need smaller investments, have greater flexibility of operation, use low-grade fuel and employ a large proportion of man power.

5. There are a large number of so-called direct reduction processes in various stages of development, which produce, in some instances, a high grade product equivalent to scrap and, in others, some variety of pig iron. The choice of the process will depend on the types and costs of fuel and energy available, capital costs/annual ton capacity, market size, quality, quantity and type of ore, etc.

6. Steelmaking on a small or medium scale does not present the same problems as ironmaking. The basic oxygen or L-D process appears to be suitable for small scale conversion of pig iron to steel. One of the advantages of the L-D process is the

lower capital investment as compared with conventional open-hearth melting shop.

7. Under favourable conditions of electric power and scrap supplies, electric furnaces produce steel at costs comparable with open-hearth furnaces. At the same time, capital investment is appreciably lower, about 60% of the open-hearth. It must, however, be mentioned that in most of the less-industrialized regions the situation regarding power and scrap supplies is far from favourable.

8. The use of direct reduced iron as a substitute for scrap in steelmaking has been studied extensively in recent years. Although investigators have reported promising results on the utilization of sponge iron as melting stock for electric furnaces, open-hearths, basic oxygen converters and hot-blast cupolas, there are still a number of problems. Suggestions have been made that concentration and briquetting of the metallic fraction of the sponge would eliminate or reduce many of the problems but would add to both capital and operating costs.

9. A brief mention is made of hot-blast cupolas for steel plants and foundries. It appears that basic hot-blast cupolas may be one means of providing hot metal for steelmaking without the construction of additional blast furnaces, particularly for smaller plants. The combination of hot-blast cupola and oxygen converter plant seems to rank among the lowest in capital cost and production cost for ingot producing facilities.

10. Attention is drawn to the use of carbon injection technique to raise the carbon level of grey cast iron melted in a cold-blast cupola. It seems that a substantial saving in the cost of metal charged can be realized by this technique.

11. Application of the method of continuous casting is mentioned briefly. It is pointed out that in works with outputs ranging from 50,000 tons to 300,000 tons per annum, continuous casting may replace conventional ingot casting, stripping, soaking pit and primary mill practice, with an appreciable saving in investment and operational costs.

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